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Fostering Sustainable Performance in the Renewable Energy Sector: The Mediating Role of Green Training and Development in the Impact of Top Management Support

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This research establishes a comprehensive framework to explore the direct and indirect influences of top management support on an organization's environmental performance within China's renewable energy sector. Drawing upon empirical data collected from a meticulously selected sample of 250 employees, the study employs Smart PLS for rigorous analysis. Through this method, the research unveils significant insights into the direct impact of top management support on the implementation of green training and development initiatives, as well as on sustainable performance outcomes. Notably, this study offers a unique perspective within the context of China's dynamic energy sector. By applying Smart PLS, the research ensures methodological rigor, thus guaranteeing robust findings. The study's novelty lies in its nuanced examination of these relationships, which enriches our understanding of sustainability dynamics within the Chinese energy landscape.
Keywords: Training and development, Top management support, Sustainable performance, Renewable energy sector, Green HRM practices.

INTRODUCTION

China's economic, social, and corporate development is affected by Renewable Energy's rapid expansion during the last decade. China's government has emphasized renewable energy development for three reasons. First, China's fast industrialization and growing material demands have placed pressure on domestic energy sources and increased dependency on foreign energy suppliers, threatening its energy security. China is become a major energy importer. Second, RE technologies improve wellbeing and environment. High-carbon economic activity pollutes and harms society (Song *et al.,* 2022). Resource waste is a major source of pollution, which is an increasing problem. In order to improve their environmental performance, organizations are using innovative management techniques (Obeidat *et al.,* 2020). There is evidence that Top Management Support (TMS) improves business environmental performance, even if the exact processes are still unclear (Guerci *et al.,* 2016). Few research papers in Southeast Asia have examined how leadership affects environmental performance in the context of green HRM (Rowley *et al.,* 2019). "Green HRM" is a term

that highlights HRM's contribution to company sustainability (Renwick *et al.,* 2016). Top-level management approaches to green human resource management (Boada-Cuerva *et al.,* 2019). Using green efforts to spread information may be very important for senior managers, and implementing eco-friendly practices may improve environmental performance. These initiatives not only contribute to environmental sustainability but may also yield cost reductions and add significant value (Obeidat *et al.,* 2020).

The concept of "green training and development" emerges as a key driver for business sustainability within the Chinese energy sector (Xie and Zhu, 2020). Notably, senior managers can play a crucial role by incorporating green initiatives into their training methods, fostering eco-friendly approaches that not only contribute to environmental performance but also offer potential cost reductions and increased value (Liu *et al.,* 2020). In the Chinese energy sector, embracing such practices in Talent Management Systems, green training and development, and sustainability efforts becomes paramount for achieving both ecological responsibility and operational excellence. Green training and development help firms achieve their environmental objectives. "Green training" may

enhance employee environmental awareness (Renwick *et al.,* 2016). Leaders should promote environmental . Scholars found that prior studies neglected senior management support and actions in HRM programs (Boada-Cuerva *et al.,* 2019). Investors, labor, consumers, and NGOs/society were highlighted. Green training's environmental advantages are uncertain; thus, executives have neglected them. No research examined senior management's environmental training and performance on sustainable performance. Leadership may influence HR via green training to improve environmental performance (Boada-Cuerva *et al.,* 2019).

Despite the increasing significance of green training and development in promoting environmental sustainability within the energy sector, there exists a notable research gap, particularly in the context of specific industries like the Chinese energy sector (Singh *et al.,* 2019; Wang *et al.,* 2022). Limited studies have systematically explored the nuanced impact of green training initiatives on environmental performance, hindering a comprehensive understanding of the mechanisms and effectiveness of such programs in this unique and critical industry (Liu *et al.,* 2020; Zhang *et al.,* 2019). This research vacuum underscores the need for empirical investigations that delve into the specific challenges and opportunities related to green training within the Chinese energy sector, thus contributing to the broader discourse on sustainable practices in the energy industry (Zhang *et al.,* 2019).

This research aims to address the identified gap by investigating the role of green training and development in enhancing environmental performance within the Chinese energy sector. The study seeks to elucidate the specific skills and knowledge areas imparted through green training, evaluate their practical implementation in the industry, and assess the overall influence of these initiatives on reducing environmental impact. By achieving these objectives, the research aims to provide valuable insights for industry stakeholders, policymakers, and researchers involved in advancing sustainable practices within the dynamic landscape of the Chinese energy sector. In light of these concerns, we set out to examine three main questions: (1) how Top management support affects green training and development; (2) does top management support have direct impact on sustainable performance; and (3) does green training and development mediate the relationship between top management support and sustainable performance.

LITRATURE REVIEW

***Top management support and Green training*:** The correlation between top management support and green training has become a focal point of scholarly exploration in the broader domain of organizational sustainability. Numerous studies highlight the decisive role that top management assumes in shaping an organization's dedication to environmental endeavors, including programs for green training (Parumasur, 2013). Top management support emerges as a critical factor in the effective execution of green human resource management (HRM) practices, which encompass initiatives for green training (Lee *et al.,* 2018). Their research underscores that active endorsement and participation by top management in sustainability initiatives communicate a clear organizational commitment to environmentally responsible practices, cultivating a culture that prioritizes and values green training (Liu *et al.,* 2020).

Moreover, scholars argue that top management support goes beyond mere endorsement and involves resource allocation and integration of green goals into the overall strategic vision of the organization (Nguyen *et al.,* 2023). This aligns with the notion that green training is most effective when it is embedded within the organizational strategy and supported by dedicated resources (Antonioli *et al.,* 2013). This study investigate the impact of top management support on environmental performance, emphasizing that a strong commitment from top management positively influences the organization's ability to achieve sustainability goals, including those related to training for environmentally responsible practices (Nda & Fard, 2013).

Despite the consensus on the positive relationship between top management support and green training, the literature also acknowledges the need for further empirical exploration to understand the specific mechanisms through which top management influences the success of green training initiatives (Renwick *et al.,* 2016). As the field matures, scholars advocate for more nuanced investigations that consider contextual factors, organizational structures, and the interplay between top management and other stakeholders in driving green training efforts within diverse industries (Nguyen *et al.,* 2023).

Applying the resource-based perspective to green training and placing an emphasis on developing, supporting, and motivating the people who are genuinely learning is essential for top-level management to discover and establish new sources of sustainable competitive advantage (Lopez-Cabrales *et al.,* 2017). Employees' environmental knowledge, abilities, attitudes, and competencies may also affect a company's capacity to react to environmental challenges in the local community (Renwick *et al.,* 2016). The green HRM practices promote the learning skills of employees by educating them how available tangible resources can be survived for a long period of time. The top management develop the roadmap and set milestones how to familiarize employees with green practices of training. The inquiry we conducted was motivated by the following query:

H1: there is direct and significant relationship between top management support and green training and development.

***Top management support and sustainable performance*:** Top management support remains a critical factor for ensuring sustainable organizational performance. Research

highlights its essential role in driving environmental initiatives, exemplified by its correlation with environmental health performance through the endorsement of environmental management systems (Gadenne *et al.,* 2009). Scholars, including (Pham *et al.,*2020), underscore the substantial impact of top management support and dedication on green purchasing and environmental collaboration between firms and their suppliers. Moreover, (Hao *et al.,* 2019) underline that leaders who return and possess an understanding of environmental concerns have a substantial impact on the success of green innovation in Chinese manufacturing companies. This includes sharing of environmental information, lower energy and material usage, green patent filings, and innovative green concepts. To improve management's overall environmental performance, it is suggested that senior executives promote environmental projects (Henry *et al.,*2019). They assert that top management support acts as a critical driver for the successful implementation of sustainability initiatives, setting the organizational tone for a commitment to environmentally and socially responsible practices. This includes championing sustainability efforts and fostering a culture aligning business strategies with sustainable goals. Academics explore the significant influence of senior management backing and confirm its effect on forming organizational strategies for long-term social and environmental sustainability (Ilyas *et al.,* 2020). The research contends that the creation and application of sustainability plans are significantly influenced by top management support, which in turn enhances overall sustainable performance. Although there is empirical evidence that top management support improves sustainable performance, researchers understand that more in-depth studies that take industry-specific obstacles, organizational culture, and contextual factors into account are necessary to fully understand the effects of sustainability initiatives (Hao *et al.,* 2019). Collectively, these studies contribute to understanding the intricate interplay between top management support and sustainable performance, underscoring the ongoing need for further research to uncover specific mechanisms through which top management fosters sustainability within organizations.

H2: There is direct and significant relationship between top management support and Sustainable performance.

MATERIALS AND METHODS

Using a survey questionnaire sent out to a certain demographic in order to gather primary data, this study follows the steps of quantitative research. This research looks at a group of 250 senior executives from 88 different Chinese electricity providers; they have all been through leadership and management development programs before. This sample was carefully chosen to provide a detailed look at the viewpoints and backgrounds of influential people in China's

electrical sector. Before developing the survey, the research team made adjustments to measuring scales found in the literature to make sure they were appropriate for our study. As part of this process, we reviewed and adjusted existing metrics to fit the needs of senior executives in China's electrical industry. Ensuring that the survey instrument properly captured the constructs under consideration, great care was taken to ensure the validity and reliability of the modified measures. Important factors like green training and corporate sustainability were included in the poll. By means of Likert-type scales and structured questions meant to measure attitudes and actions, respondents were asked to provide insights into their experiences and perspectives. Executives at the highest levels who have had formal training in management and leadership bring unique perspectives to the table, enhancing the study's results with a wealth of knowledge. With this methodology, quantitative data may be systematically analyzed, opening the door to statistical investigations of inter-variable interactions. This study intends to contribute to the existing literature on sustainable practices in organizations by drawing on a representative sample of senior executives in China's electrical sector to shed light on the relationship between green training, firm sustainability, and the backing of upper management. Three key elements made up the survey: (a) top management support, (b) green training & development (c) sustainable performance. We utilized a 5-point Likert scale where 1 for strongly disagree and 5for strongly agree. The TMS scale was adopted from five item scale was used to measure green training scale which is adopted from (Teixeira *et al.,* 2016) and (Pinzone *et al.,* 2019). Five-item scale was adopted from (Paillé *et al.,* 2014) to measure sustainable performance.

ANALYSIS

***Measurement model evaluation*:** As shown in Table 1, convergent and discriminant validity metrics were used to thoroughly evaluate the model's validity and reliability. Using standard deviation (SD), average variance extracted (AVE), and composite reliability (CR), the time necessary for convergence—a vital indicator—was computed. In accordance with predetermined standards, a variable cannot be deemed dependable until both the AVE and CR are more than 0.50 and 0.70, respectively (Hair *et al.,* 2016). All of the AVE and CR values above these cutoffs, according to our research, confirming the validity of the model's variables. This proves the consistency and stability of the measurement model by showing that each latent concept has a significant convergent validity. The percentage of variation collected by the construct in relation to the measurement error is measured by the Average variation Extracted (AVE). A result greater than 0.50 indicates convergent validity that is good (Hair *et al.,* 2020). The internal consistency of the constructs is evaluated using the Composite dependability (CR), with a

score higher than 0.70 signifying strong dependability (Henseler *et al.,* 2009). Our model's conformance to these defined standards guarantees the stability and reliability of the measurement model used in this investigation. The stringent evaluations conform to the tenets of Smart PLS analysis and enhance the general reliability of the variables included in our investigation (Hair *et al.,* 2020; Henseler *et al.,* 2009). This comprehensive reliability and validity analysis establishes a strong foundation for the subsequent stages of the study, affirming the accuracy and consistency of the measurement model employed for data analysis.

Table 1. Reliability and validity Analysis.

Variables	Item loading	AVE	CR	A
Top management support		0.530	0.793	0.710
TMS1	0.743			
TMS2	0.772			
TMS3	0.792			
TMS4	0.703			
Green training and development		0.502	0.710	0.802
GTD1	0.791			
GTD2	0.702			
GTD3	0.785			
GTD4	0.700			
GTD5	0.743			
Sustainable performance		0.694	0.798	0.700
SP1	0.765			
SP2	0.786			
SP3	0.796			
SP4	0.796			
SP5	0.705			

Note: TMS: top management support; SP: sustainable performance; PLS: Partial least square modeling; GT&D: Green training and development

***Predictive accuracy*:** The dependent variable's proportion of variation that can be attributed to changes in the independent variable is represented by the R2 (R-Square) values in Table 2. Measuring the model's ability to explain phenomena, the R2 statistic is used. The table illustrates the R2 value as 0.721 in relation to sustainability performance. Approximately 72.1% of the variability seen in sustainability performance may be attributed to differences in the independent variables analyzed inside the model. Overall, the R2 value offers insightful information about how much the selected independent factors contribute to the explanation of observed differences in sustainability performance within the environment under study.

Table 2. Predictive accuracy

Variable	R square
Sustainable Performance	0.721

***Structural model evaluation*:** Table 2 shows the structural model evaluation. In this study the first Hypothesis is that TMS have direct relationship with green training and development with (β= 0.420, t-value= 4.321 P-value= 0.001). however, H2 hypotheses that Top management have direct relationship with Sustainable performance. the findings illustrate that top management have significant direct influence on sustainable performance with (β= 0.602, t-value= 6.301, P-value= 0.000). Finally, H3 stated that green training and development mediate relationship between top management support and sustainable performance. the results indicate that green training and development have significant mediating role between top management support and sustainability (β= 0.302, t-value= 3.295, P-value=0.000). findings support H1, H2, and H3.

DISCUSSION

The major goal of this study was to look at how Talent Management Systems (TMS) may help businesses improve their green training and development programs. The function of green training acts as a mediator between the influence of top management support on business sustainability. In this particular setting, a firm's sustainability results are significantly influenced by the backing of senior management. The idea that green training plays a mediating function implies that the adoption of ecologically oriented training efforts might further extend the beneficial impact of top management support. This mediating mechanism emphasizes how crucial organizational leadership is in encouraging sustainability initiatives, and how crucial green training is in converting this support into observable and long-lasting results for the company. It was shown that TMS comes first when it comes to green training and development programs. Although other studies have investigated how TMS affects green HR practices (Obeidat *et al.,* 2020), The precise ways in which TMS impacts eco-green training and development are yet not well understood. Companies that invest in green training are more likely to have cutting-edge environmental management systems, according to research (Renwick *et al.,* 2016; Yong *et al.,* 2020). However, according to the research, green training programs often aim to increase participants' preexisting environmental consciousness (Ng and Siu, 2004; Teixeira *et al.,* 2016). The role of top management in implementing green training and the degree to which green training contributes to an organization's overall sustainable performance need to be further investigated, even if these studies provide important contributions. The second main focus of this study was to understand how TMS affects sustainable performance in the long run. The results of our research show that TMS may have a favorable effect on how workers view their company's environmental performance. These findings are consistent with other studies that have shown a link between long-term

performance and environmental support from senior management (Nguyen *et al.,* 2023). Future study might investigate the subtleties of top management's involvement in developing and executing such programs, as well as the precise TMS components that most significantly contribute to the effectiveness of green training. To further enhance our knowledge of the relationship between talent management systems, green training, and environmental sustainability, it would be beneficial to investigate the long-term impacts of TMS on sustainable performance and how it affects the success of organizations.

***Conclusion*:** Evaluating how green training could moderate the connection between top management support (TMS) and sustainable performance over the long run was one of the main goals of this study. The results provide strong support for the claim that TMS has a significant impact on environmentally conscious training and development programs, which in turn shapes how people see sustainable performance. An organization's environmental performance is impacted by many different parties, but one important component is the application of green training. Consistent with anecdotal evidence from other studies, our findings support the idea that green training may influence stakeholder demands on environmental behaviors and performance. Importantly, a common pattern in recent studies has been to leave top management out of stakeholder pressure metrics. Our research fills this knowledge vacuum by shedding light on the role of training as a mediator between stakeholder demands and environmental performance, as experienced by top-level managers in Vietnam's electric power sector. A more complete picture of how environmental results in this business are impacted by the combined efforts of top management and wider stakeholder demands is presented by this nuanced knowledge, which casts light on the complex dynamics at work. As a result, this research has explored the vital dynamics pertaining to how top management support affects a firm's sustainability, with an emphasis on the mediating function that green training plays. The results highlight the noteworthy beneficial impact that senior management backing has on augmenting company sustainability in the studied setting. The most important finding is that green training serves as an intermediate, underscoring its critical role in converting top management support into observable and long-lasting results for the company. The study's findings are especially pertinent given the current economic environment, where sustainability has turned into a strategic need for many companies, including those in the energy industry. Research indicates that when senior leadership engages in green training while also actively supporting sustainability projects, a synergistic impact is created that drives the firm toward improved sustainability practices. Comprehending the interdependence of green training, firm sustainability, and top management support

becomes crucial for enterprises operating in the Chinese energy industry. This information emphasizes the significance of coordinating leadership support with focused training activities and offers organizational leaders strategic insights for navigating the challenging terrain of sustainability. In conclusion, our findings highlight the strong relationships between TMS, green training, and the environmental performance of any given firm. This study brings attention to the moderating effect of green training and the often-overlooked role of senior management in stakeholder pressures. It advances our understanding of the complex relationships within the context of sustainable performance in Vietnam's electric power industry. Theoretically, these findings add to the body of knowledge on organizational sustainability, and practically, they have consequences for people working in the field and governments aiming to improve environmental performance via training and talent management strategies.

***Limitations and future directions*:** Our study recognizes several limitations that underscore the need for further research. The reliance on cross-sectional data poses challenges in establishing causal relationships, prompting us to advocate for longitudinal investigations into the dynamics between Talent Management Systems (TMS), green training, and organizational environmental performance. Long-term studies are imperative to assess whether green training moderates TMS-sustainable performance effectively. Furthermore, the absence of controls for variables like firm size and power plant capacity in our survey may introduce biases when examining TMS impacts through green training. Future studies should consider and account for these organizational traits to enhance the robustness of findings. The use of subjective assessments in our study calls for the incorporation of realistic pre- and post-training performance data to bolster the evidence of training effectiveness. To ensure broader applicability, future research should evaluate and validate our methodology across diverse industries and growing nations. Additional study might investigate industry-specific variations and the subtle aspects of green training programs that have the greatest effect. Another way to find out how long green training and consistent support from upper management last is to look at how these practices affect sustainability in the long run. All things considered, this research adds to what is already known about corporate sustainability practices, with a focus on the importance of green training as a mediator and the crucial role of support from upper management.

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